d. Find a particular equation of $f(x)$. Show by plotting that all the $f(x)$-values in the table satisfy the equation.

e. Use the equation to calculate $f(25)$. Interpret the solution.

SOLUTION

a. Follow the add pattern in the x-values until you reach 12, and follow the multiply pattern in the corresponding $f(x)$-values.

x (h)	$f(x)$ (μCi)
10	0.3125
12	0.15625

$f(12) = 0.15625\ \mu\text{Ci}$

b. The data points have the add–multiply property of exponential functions.

c. 22, 24, 26 — Extend the add pattern in the x-values.

The x-values skip over 25, so $f(25)$ cannot be found using the pattern.

d. $f(x) = ab^x$ — General equation of an exponential function.

$\begin{cases} 5 = ab^2 \\ 2.5 = ab^4 \end{cases}$ — Substitute any two of the ordered pairs.

$\frac{2.5}{5} = \frac{ab^4}{ab^2}$ — Divide the equations. Have the larger exponent in the numerator.

$0.5 = b^2$ — Simplify.

$0.5^{1/2} = b$ — Raise both sides to the $\frac{1}{2}$ power.

$b = 0.7071\ldots$ — Store without rounding.

$5 = a(0.7071\ldots)^2$ — Substitute the value for b into one of the equations.

$a = \frac{5}{0.7071\ldots^2} = 10$ — Solve for a.

$\therefore f(x) = 10(0.7071\ldots)^x$ — Write the particular equation.

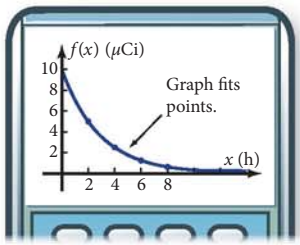

Figure 2-3e

Figure 2-3e shows the graph of f passing through all four given points.

e. $f(25) = 10(0.7071\ldots)^{25} = 0.0017\ldots$

This means that there was about 0.0017 μCi of 18-FDG after 25 h. ◀

Note that part d in Example 5 calls for "a" function that fits the points. It is possible for other functions to fit this set of points, such as the function

$g(x) = 10(0.7071\ldots)^x + \sin\frac{\pi}{2}x$ — See Chapter 5 for the meaning of the sine function.

which also fits the given points, as shown in Figure 2-3f. Deciding which function fits better will depend on the situation you are modeling. Also, you can test further to see whether your model is supported by data. For example, to test the second model, you could collect measurements over shorter time intervals and see if the data have a wavy pattern.

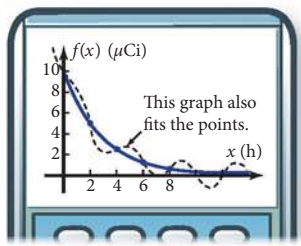

Figure 2-3f